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Association of healthcare expenditures with aggressive versus palliative care for cancer patients at the end of life: a cross-sectional study using claims data in Japan.

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Abstract

Background: End-of-life (EOL) care imposes heavy economic burdens on patients and health insurers. Little is known about the association between the types of EOL care and health care costs for cancer patients across various providers.

Objective: To explore the association of health care expenditures with benchmarking indicators of aggressive versus palliative care among terminally ill cancer patients, from the perspective of health insurers.

Design: Cross-sectional retrospective study using health insurance claims data.

Setting/Participants: Cancer patients who had died in Kyoto prefecture, Japan, between April 2009 and May 2010.

Main Outcome Measure: Claims data were analyzed using multilevel generalized linear models to examine whether aggressive care and palliative care were associated with

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expenditures during the last 3 months of life, after adjusting for patient characteristics, hospital characteristics, and other non-indicator procedures.

Results: We analyzed 3,143 decedents from 54 hospitals. Median expenditure per patient during the last 3 months was US$13,030. Higher expenditures were associated with the aggressive care indicators of higher mortality at acute-care hospitals and use of chemotherapy in the last month of life, as well as with the palliative care indicators of increased hospice care and opioid use in the last 3 months of life. However, increased physician home care in the last 3 months was associated with lower expenditure.

Conclusions: Indicators of both aggressive and palliative EOL care were associated with higher health care expenditures. These results may support the coherent development of measures to optimize aggressive care and reduce the financial burdens of terminal cancer care.

Key words: quality measurement; neoplasms; economics; administrative data; intensive care; palliative care.

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Introduction

The populations of many developed nations are aging rapidly, accompanied by dramatic increases in national health care costs. End-of-life (EOL) care imposes a substantial economic burden on patients and health insurers, and the EOL component of health care costs are frequently targeted in efforts to control overall costs [1,2]. Although numerous reports have been published on health care costs and the utilization of health care services in terminally ill patients, these tend to focus on all-cause mortality [1-8]. Among the leading causes of death, cancer has one of the highest fatality rates in many countries, including Japan [9]. Currently, there are not many studies that have explored EOL health care expenditures associated with cancer patients irrespective of cancer type [10-19]. Little is known about the determinants of EOL health care expenditures incurred for treating terminally ill cancer patients in various health care settings. Therefore, comprehensive studies that integrate various settings (e.g., hospitals, intensive care units [ICU], hospices, and patient homes) are required.

The quality of EOL care has also been the focus of numerous studies. Quality indicators based on procedures for terminal cancer care have been developed for analyses using administrative data [20-25]. Although intensive treatments may be employed during EOL care, aggressive procedures do not necessarily correlate with better quality of life (QOL) for the patients [26-29]. Therefore, replacing certain aspects of aggressive care in favor of increased palliative care may improve QOL and reduce the use of health care resources [2, 26].

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Unfortunately, little is known about the relationship between aggressive/palliative care and health care expenditures at the EOL.

In contrast to the US and Europe, palliative and hospice care are not well-established in Japan and other Asian countries [30]. Approximately 80% of terminally ill patients in Japan die in hospitals, while only 3% of deaths occur at hospices [31].

Understanding the associations between health care expenditures and the provision of aggressive/palliative care at the EOL can help clinical leaders and policy-makers to optimize EOL care and reduce expenditures. In this study, we aimed to explore the association of EOL health care expenditures with aggressive versus palliative care indicators from the perspective of health insurers, based on a comprehensive analysis of administrative claims data of terminally ill cancer patients in Japan.

Methods

Study design and data source

We conducted a cross-sectional retrospective analysis using health insurance claims data from Kyoto prefecture, Japan. The data source comprised reimbursement claims electronically submitted from health care providers to National Health Insurance (NHI) and Long Life Medical Care System (LLMCS), two major insurance payers in Japan. NHI provides insurance coverage for individuals not working in companies (e.g., farmers, the self-employed,

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retirees, the unemployed, part-time workers, and their families). LLMCS provides coverage for individuals aged 75 years or older, as well as for disabled individuals aged 65–74 years. Both the NHI and LLMCS pay for the majority of medical services and medications for beneficiaries, including palliative care services (e.g., hospice care, physician home care, and opioid use).

Study population

A total of 3,323 cancer patients who had died between April 2009 and May 2010 with available claims records for at least 3 months prior to death were included in this study. Cancer was defined according to the International Classification of Diseases, 10th Revision (ICD-10, codes Cxx.x). We excluded from analysis patients who did not receive EOL care at hospitals or hospices during their last 3 month of life (n = 23) and those who received EOL care at hospitals with fewer than 10 terminally ill cancer patients (n = 157). There were 3,143 patients included in the final analysis.

Response variable

The response variable used in this study was direct health care expenditures (including copayment and health insurance coverage) for each decedent during the last 3 months of life across various health care settings (inpatient, outpatient, hospital, hospice, office, home care,

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and pharmacy). We focused on the last 3 months of life because it has been previously stated that terminally ill patients should ideally receive hospice care for 3 months before death [32].

Explanatory variables

Data on patient characteristics were obtained using claims data corresponding to the last 3 months of life. Types of cancer were classified into the following categories based on ICD-10 codes (Table 1): lung, stomach, colorectum, liver, pancreas, biliary tract, blood (leukemia, Hodgkin's disease, and non-Hodgkin's lymphoma), prostate, breast, and others. A comorbidity score was calculated according to ICD-10 coding algorithms for the Charlson Comorbidity Index (excluding cancer-related diseases) [33].

We used the recommended benchmark measures for terminal cancer care developed and validated by Earle et al. [20-25] to identify aggressive and palliative procedures from administrative data. These measures were: (a) dying at acute-care hospitals (aggressive care), (b) receiving chemotherapy using cytotoxic agents or molecular-targeted therapies during the last month of life (aggressive care), (c) admission to ICUs or receiving life-sustaining treatments (cardiopulmonary resuscitation, intubation, or mechanical ventilation) during the last month of life (aggressive care), and (d) admission to institutional hospices or palliative care units during the last 3 months of life (palliative care). Additionally, the following procedures during the last 3 months of life were included as indicators of palliative care: (e)

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palliative team consultation using multidisciplinary approaches [20, 24, 25], (f) opioid use [23], and (g) home care provided by family practitioners [24, 25]. The following non-indicator procedures were identified as potential confounding factors: total parenteral nutrition, dialysis, blood transfusion, rehabilitation, surgery, and radiotherapy during the last 3 months of life. Also included as potential confounding factors were chemotherapy, ICU admission, or life-sustaining treatments during the last 2 months prior to the month in which the patient died.

Treatment hospitals during the last 3 months of life were identified for each patient in the following order: the first acute-care hospital that provided inpatient care, followed by the first acute-care hospital that provided outpatient care, and finally the first hospice. Hospital characteristics included hospitals teaching status, urban/rural location (urban referring to any location within the prefectural capital city and rural referring to anything outside the city), and ownership (governmental, public, or private).

Statistical analysis

Multilevel regression models were developed for patients clustered in hospitals, with a random intercept at level 2 used to handle data comprising patients within a given hospital. Patient characteristics, the various indicator procedures, and non-indicator procedures were used as explanatory variables at level 1; hospital characteristics were added at level 2.

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Because the distribution of health care cost data is typically skewed to the right, generalized linear models (GLM) with a gamma distribution and log link function were used to evaluate health care expenditures [34]. Gamma regression models are multiplicative. Using an approach outlined in a previous study [3], the exponentiated coefficients of each explanatory variable were interpreted as rate ratios (RRs), with an RR of 1 indicating no association of that explanatory variable with increased or decreased values of the response variable. All explanatory variables used in the multilevel GLM were calculated as categorical variables.

We performed three sets of multivariable analyses. In the first model (Model 1), patient characteristics and hospital characteristics were included in analysis. In the second model (Model 2), non-indicator procedures were entered in addition to the variables included in Model 1. In the third model (Model 3), aggressive/palliative indicators of EOL care were entered in addition to the variables included in Model 2. Model 3 was used to assess the association between aggressive/palliative indicators of procedures and health care expenditures at EOL, while controlling for patient characteristics, hospital characteristics, and other non-indicator procedures. The goodness of fit of each model was compared using the Akaike Information Criterion (AIC), where smaller values denote a better fit.

We used IBM SPSS version 19 (SPSS Inc., Chicago, IL) for data manipulation and SAS version 9.2 (SAS Institute Inc., Cary, NC) for analyses. A two-sided test was used and $P < 0.05$ was considered significant. All health care expenditures were reported in US dollars,

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using the 2011 purchasing power parity rate for Japanese yen to US dollars (¥107 = $1) from the Organization for Economic Cooperation and Development (OECD) National Accounts database.

Results

The present study involved 3,143 decedents from 54 hospitals. Median health care expenditure per patient during the last 3 months of life was $13,030 (interquartile range, $8,120–$18,970).

Table 2 shows the patient and hospital characteristics of the study sample. Hospital-level data for each patient is included and expressed as the number of patients in each category. The majority of decedents were in the 75–79 years age group, with a higher proportion of men. The most common type of cancer was lung cancer, followed by gastric cancer. Our findings showed that patients died predominantly in acute-care hospitals (89%), and that 7% of patients underwent chemotherapy during the last month of life. Nine percent of patients were admitted to ICUs or received life-sustaining treatments during the last month; 6% and 3% used hospice services and received palliative team consultation, respectively.

Patient and hospital characteristics and health care expenditure

Table 3 shows RR estimates for the multivariable regression models used in this study. Model

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1 evaluated the association between patient and hospital characteristics and health care expenditures during the last 3 months of life. After adjusting for other patient characteristics, age was found to be significantly associated with health care expenditure. Also, when compared with lung cancer patients, the health care expenditures for EOL care were significantly lower in patients with liver cancer and higher for those with blood or prostate cancer. Patients from hospitals in urban areas incurred higher expenditure compared with those in rural areas.

Non-indicator EOL procedures were entered into Model 2 in addition to the variables included in Model 1. For non-indicator procedures, results are presented as an RR for patients who received a non-indicator procedure when compared with those who did not receive it (serving as the referent group), after adjusting for patient and hospital characteristics and other non-indicator procedures. All procedures were found to be significantly associated with higher expenditures. Teaching, public, and private hospitals were associated with lower expenditures than non-teaching and governmental hospitals.

Aggressive versus palliative care and health care expenditure

Model 3 was used to assess the association between aggressive/palliative EOL care and health care expenditure during the last 3 months of life (Table 3). Results for aggressive/palliative care in Model 3 are presented in the same way as non-indicator procedures in Model 2, with

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patients who did not receive the procedures used as the referent groups. Similar to Models 1 and 2, factors showing significant association with health care expenditures included age, certain cancer types, Charlson Comorbidity Index, non-indicator procedures, and certain hospital characteristics. Also, significant associations were found between aggressive treatments and higher expenditures. Patients who died in acute-care hospitals were associated with higher expenditure when compared with those who died at home or at a hospice (RR: 1.32; 95% confidence interval [CI] 1.21–1.44). Patients who underwent chemotherapy during the last month of life were associated with higher expenditure when compared with those who did not (RR: 1.25; 95% CI 1.17–1.34). ICU care or life-sustaining treatments during the last month were not associated with health care expenditures for insurers.

Our results showed that specific palliative procedures were significantly associated with either an increase or decrease in health care expenditures. The RRs (95% CI) of hospice services, opioid use, and physician home care in Model 3 were 2.31 (2.07–2.59), 1.07 (1.03–1.11), and 0.90 (0.84–0.98), respectively. We found no significant association between palliative team consultation and health care expenditure. The AIC indicated that Model 3 fitted the data better than Models 1 and 2.

Discussion

This study explored the association of health care expenditures with aggressive versus

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palliative care for terminally ill cancer patients across various health care settings. Our findings were obtained from a single dataset, which showed that both aggressive and palliative procedures were differentially associated with variations in expenditures. The novelty of this study lies in the identification of specific terminal procedures that are significantly associated with EOL expenditures based on a comprehensive analysis of direct health care expenditures for terminally ill cancer patients.

Our study showed that aggressive care was generally associated with higher health care expenditures. On the other hand, physician home care (regarded as palliative care) was associated with reduced expenditures. These results are similar to those of previous studies attributing cost differences to a reduction in acute-care services provided during EOL [4, 5, 10]. Other studies have shown that physician home care is associated with good QOL and better satisfaction at EOL [4, 27, 28]. Our findings corroborate these reported results, and may indicate that measures to improve cost savings and QOL can involve the control of aggressive care and promotion of home care for terminal cancer patients, although this requires further studies to determine if there is a causal relationship between these factors [2, 26].

To promote cost savings and reduce aggressive care at the EOL, several fundamental problems must first be addressed. First, physicians are not always accurate in predicting actual time to death [35]. Second, there are no gold standards for the appropriate time to stop aggressive therapy. Third, patients are rarely prepared for death, which may be exacerbated in

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many Eastern countries due to taboos against open discussions concerning death [30]. Advance directives documenting patient preferences for the use or avoidance of life-sustaining treatments or procedures have been shown to reduce health care expenditures [1, 11]. New policies are required to encourage people to consider more preferable ways to die, to promote physician and medical student education about EOL care, and to expand palliative care programs in hospitals.

Japan is promoting the policy of home death in anticipation of an increase of decedents incurring huge health care expenditures at the EOL [36]. The promotion of physician home care and eventual death at home may be a possible means to reduce the surge in EOL health care expenditures that can be expected from the rising number of decedents in aging Japan. This policy may take the form of improved systems and incentives for physicians to provide home care, as well as engaging patient interest groups to improve acceptance of death at home.

We demonstrated that hospice service and opioid use, which were used as palliative care indicators, were associated with increased health care expenditures. With regard to whether hospice services generate more cost or enable cost savings, our findings differ from those of previous studies from other countries, which have indicated that hospice services reduce overall health care costs [6-8, 12, 13]. This inconsistency may be due to the higher fees for hospice care when compared with acute care in Japan.

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Limitations

Our study has several limitations that should be noted. Firstly, because a claims database was used in this study, we were unable to include information regarding other health outcomes such as QOL, patient satisfaction, patient preferences, or clinical details which might further explain cost-related differences. This may lead to possible confounding of the results, but is an intrinsic limitation of administrative data-based studies. Secondly, this study is a retrospective observational analysis, and as such is unable to determine causal relationships. Finally, although Japan has a long-term care (LTC) insurance system which supports the elderly living at home or in nursing care facilities, LTC insurance claims data were not available for analysis. This insurance program provides payment for in-home care and facility services, including nursing care and rehabilitation. Patients who receive physician home care may use these services covered by LTC insurance. Hence, further studies are needed to incorporate data from both health and LTC insurance claims databases.

With regard to home care, an association between having nearby family and lower health care costs has been reported, which may indicate that relatives can act as caregivers to help patients avoid undesired hospitalizations [3]. However, policies that promote home care may lead to the shifting of costs from health insurers to LTC insurers, patients, or relatives in the form of having to provide more formal care, loss in productivity, or additional payments

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for hired caregivers. Further investigations from the societal perspective are warranted in order to better inform the policymaking process.

Conclusions

In this study, we evaluated the association of health care expenditures with aggressive versus palliative care for terminally ill cancer patients in Japan. Our findings show that certain modes of both aggressive and palliative care during the last few months of life were associated with increased health care expenditures independent of other factors, and that physician home care was associated with reduced expenditures. The findings in this study may help to identify specific candidate measures to reduce the financial burdens of terminal cancer care.

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Conflict of interest statement

None declared.

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Table 1. ICD-10 codes for cancer types

Type	Codes
Lung	C34.x
Stomach	C16.x
Colorectum	C18.x, C19.x, C20.x
Liver	C22.x
Pancreas	C25.x
Biliary tract	C23.x, C24.x
Blood	C81.x–C85.x, C91.x–C95.x
Prostate	C61.x
Breast	C50.x
Other	C00.x–C15.x, C17.x, C21.x, C26.x, C30.x–C33.x, C37.x–C41.x, C43.x–C49.x, C51.x–C58.x, C60.x, C62.x–C80.x, C88.x, C90.x, C96.x, C97.x

ICD-10, International Classification of Diseases, 10th Revision.

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Table 2. Study population characteristics and performance of aggressive and palliative care indicators

No. of patients	3143
Patient characteristics	
Women	1249 (40)
Age, y	
<65	383 (12)
65–69	388 (12)
70–74	452 (14)
75–79	698 (22)
80–84	631 (20)
≥85	591 (19)
Cancer type	
Lung	622 (20)
Stomach	444 (14)
Colorectum	367 (12)
Liver	302 (10)
Pancreas	265 (8)
Biliary tract	151 (5)
Blood	180 (6)
Prostate	91 (3)
Breast	80 (3)
Other	641 (20)
Charlson Comorbidity Index	
0–1	1197 (38)
2	642 (20)
3	434 (14)
≥4	870 (28)

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Table 2 continued

Procedures	
Aggressive care	
Death at acute-care hospitals	2811 (89)
Chemotherapy[a]	234 (7)
ICU care or life-sustaining treatments[a]	284 (9)
Palliative care	
Hospice care[b]	202 (6)
Palliative team consultation[b]	86 (3)
Opioid use[b]	1697 (54)
Physician home care[b]	172 (5)
Non-indicator procedures	
Total parenteral nutrition[b]	1126 (36)
Dialysis[b]	48 (2)
Blood transfusion[b]	871 (28)
Rehabilitation[b]	686 (22)
Surgery[b]	104 (3)
Radiotherapy[b]	216 (7)
Chemotherapy[c]	1196 (38)
ICU care or life-sustaining treatments[c]	86 (3)
Hospital characteristics	
Teaching hospital	2075 (66)
Urban location	2029 (65)
Ownership	
Governmental	1031 (33)
Public	642 (20)
Private	1470 (47)

Values are expressed as number of patients (column percentage). Because of rounding, percentages may not add up to 100%. Patients who had undergone more than one procedure are accordingly classified into more than one category for procedures. [a] Identified during the last month of life. [b] Identified during the last 3 months. [c] Identified during the last 2 months prior to the month in which the patient died. ICU, intensive care unit.

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Table 3. The association between health care expenditures during the last 3 months of life and patient characteristics, hospital characteristics, non-indicator procedures, and aggressive/palliative care

	Model 1		Model 2		Model 3	
	Rate ratio (95% CI)	*P* value	Rate ratio (95% CI)	*P* value	Rate ratio (95% CI)	*P* value
Patient characteristics						
Women	0.99 (0.95–1.04)	0.81	1.00 (0.96–1.04)	0.88	1.00 (0.96–1.03)	0.82
Age[a]						
65–69	0.91 (0.83–0.99)	0.02	0.91 (0.84–0.98)	0.01	0.93 (0.87–1.00)	0.05
70–74	0.93 (0.86–1.02)	0.11	1.00 (0.93–1.08)	0.92	1.02 (0.95–1.09)	0.55
75–79	0.91 (0.84–0.98)	0.01	0.95 (0.89–1.02)	0.13	0.97 (0.91–1.03)	0.33
80–84	0.80 (0.74–0.87)	<0.001	0.91 (0.85–0.98)	0.009	0.94 (0.88–1.01)	0.08
≥85	0.71 (0.66–0.77)	<0.001	0.85 (0.79–0.92)	<0.001	0.91 (0.84–0.97)	0.007
Cancer type[b]						
Stomach	1.05 (0.98–1.13)	0.19	0.91 (0.85–0.97)	0.006	0.94 (0.88–1.00)	0.04
Colorectum	1.08 (1.00–1.17)	0.07	0.98 (0.91–1.05)	0.53	0.99 (0.93–1.06)	0.79
Liver	0.82 (0.75–0.89)	<0.001	0.91 (0.84–0.98)	0.02	0.95 (0.88–1.02)	0.14
Pancreas	0.95 (0.87–1.04)	0.25	0.96 (0.89–1.04)	0.34	0.99 (0.92–1.06)	0.68
Biliary tract	1.05 (0.94–1.17)	0.35	1.03 (0.94–1.13)	0.56	1.08 (0.98–1.18)	0.11
Blood	1.81 (1.64–2.00)	<0.001	1.38 (1.26–1.51)	<0.001	1.32 (1.21–1.45)	<0.001
Prostate	1.16 (1.01–1.33)	0.03	1.02 (0.91–1.15)	0.75	0.99 (0.88–1.10)	0.79
Breast	1.07 (0.92–1.24)	0.37	1.04 (0.92–1.19)	0.53	1.04 (0.92–1.18)	0.49
Other	1.08 (1.01–1.16)	0.02	0.97 (0.92–1.03)	0.40	0.97 (0.91–1.02)	0.23
Charlson Comorbidity Index[c]						
2	0.99 (0.94–1.05)	0.86	0.95 (0.90–1.00)	0.04	0.98 (0.93–1.03)	0.37
3	1.04 (0.98–1.12)	0.20	0.98 (0.93–1.04)	0.58	0.99 (0.94–1.05)	0.85
≥4	1.15 (1.08–1.21)	<0.001	1.00 (0.95–1.05)	0.91	1.06 (1.01–1.11)	0.01

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Table 3 continued

	Model 1		Model 2		Model 3	
	Rate ratio (95% CI)	*P* value	Rate ratio (95% CI)	*P* value	Rate ratio (95% CI)	*P* value
Procedures						
Aggressive care[d]						
Death at acute-care hospitals[e]					1.32 (1.21–1.44)	<0.001
Chemotherapy*					1.25 (1.17–1.34)	<0.001
ICU care or life-sustaining treatments*					1.01 (0.95–1.08)	0.71
Palliative care[d]						
Hospice care†					2.31 (2.07–2.59)	<0.001
Palliative team consultation†					0.98 (0.87–1.09)	0.66
Opioid use†					1.07 (1.03–1.11)	<0.001
Physician home care†					0.90 (0.84–0.98)	0.01
Non-indicator procedures[d]						
Total parenteral nutrition†			1.33 (1.27–1.38)	<0.001	1.39 (1.33–1.44)	<0.001
Dialysis†			1.47 (1.26–1.71)	<0.001	1.50 (1.29–1.73)	<0.001
Blood transfusion†			1.33 (1.27–1.39)	<0.001	1.35 (1.29–1.41)	<0.001
Rehabilitation†			1.32 (1.26–1.39)	<0.001	1.35 (1.29–1.41)	<0.001
Surgery†			1.32 (1.19–1.46)	<0.001	1.31 (1.18–1.45)	<0.001
Radiotherapy†			1.32 (1.23–1.43)	<0.001	1.34 (1.25–1.44)	<0.001
Chemotherapy‡			1.14 (1.09–1.18)	<0.001	1.15 (1.11–1.20)	<0.001
ICU care or life-sustaining treatments‡			1.55 (1.38–1.75)	<0.001	1.54 (1.37–1.73)	<0.001
Hospital characteristics						
Teaching hospital[f]	0.99 (0.94–1.04)	0.69	0.92 (0.88–0.97)	0.001	0.97 (0.93–1.01)	0.18
Urban location[g]	1.31 (1.25–1.37)	<0.001	1.30 (1.25–1.36)	<0.001	1.22 (1.17–1.27)	<0.001
Ownership[h]						
Public	0.94 (0.88–1.00)	0.05	0.93 (0.89–0.99)	0.01	0.93 (0.88–0.98)	0.004
Private	0.96 (0.91–1.02)	0.16	0.91 (0.87–0.96)	<0.001	0.91 (0.86–0.95)	<0.001
Model fit statistics						
Akaike Information Criterion	94455		93513		93216	

*Identified during the last month of life. †Identified during the last 3 months. ‡Identified during the last 2 months prior to the month in which the patient died. Referent categories: [a] <65 years, [b] lung, [c] 0–1, [d] non-use of each of the procedures unless otherwise indicated, [e] home or hospice, [f] non-teaching, [g] rural, [h] governmental.

CI, confidence interval; ICU, intensive care unit.